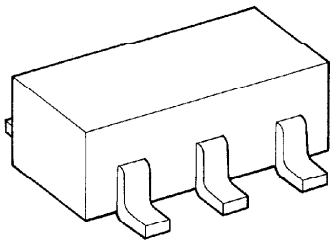
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7S14F, TC7S14FU

SCHMITT INVERTER

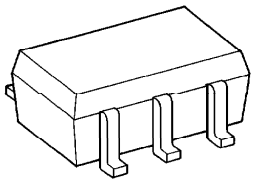
The TC7S14 is a high speed C^2MOS SCHMITT INVERTER fabricated with silicon gate C^2MOS technology.
It achieves a high speed operation similar to equivalent LSTTL while maintaining the C^2MOS low power dissipation.
Pin Configuration and function are the same as the TC7SU04F but input have 25% V_{CC} hysteresis and with its schmitt trigger function, the TC7S14F can be used as line receivers which will receive slow input signal.
Input is equipped with protection circuits against static discharge or transinent excess voltage.
Output currents are 1/2 compared to TC74HC series models.

TC7S14F



SSOP5-P-0.95

TC7S14FU



SSOP5-P-0.65A

Weight SSOP5-P-0.95 : 0.016g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

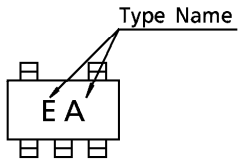
FEATURES

- High Speed ..... t_{pd} = 11ns (Typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 1μA (Max.) at Ta = 25°C
- High Noise Immunity ..... V_H = 1.1V at V_{CC} = 5V
- Output Drive Capability ..... 5 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL}$ = 2mA
- Balanced Propagation Delays ..... $t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC\,(opr)}$ = 2~6V

MAXIMUM RATINGS

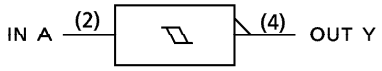
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	−0.5~7	V
DC Input Voltage	V_{IN}	−0.5~V_{CC}+0.5	V
DC Output Voltage	V_{OUT}	−0.5~V_{CC}+0.5	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±12.5	mA
DC V_{CC}/Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature (10s)	T_L	260	°C

MARKING

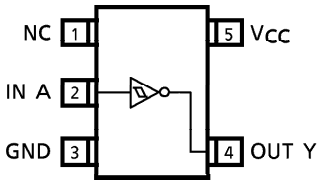


961001EBA2

LOGIC DIAGRAM



PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

A	Y
L	H
H	L

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	2~6	V
Input Voltage	V_{IN}	0~V_{CC}	V
Output Voltage	V_{OUT}	0~V_{CC}	V
Operating Temperature	T_{opr}	−40~85	°C

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		V_{CC}	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
Positive Threshold Voltage	V_P	—		2.0	1.0	1.25	1.5	1.0	1.5	V
				4.5	2.3	2.7	3.15	2.3	3.15	
				6.0	3.0	3.5	4.2	3.0	4.2	
Negative Threshold Voltage	V_N	—		2.0	0.3	0.65	0.9	0.3	0.9	V
				4.5	1.13	1.6	2.0	1.13	2.0	
				6.0	1.5	2.3	2.6	1.5	2.6	
Hysteresis Voltage	V_H	—		2.0	0.3	0.6	1.0	0.3	1.0	V
				4.5	0.6	1.1	1.4	0.6	1.4	
				6.0	0.8	1.2	1.7	0.8	1.7	
High-Level Output Voltage	V_{OH}	$V_{IN} = V_{IL}$	$I_{OH} = -20\mu A$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
			$I_{OH} = -2mA$	4.5	4.18	4.31	—	4.13	—	
			$I_{OH} = -2.6mA$	6.0	5.68	5.80	—	5.63	—	
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 20\mu A$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			$I_{OL} = 2mA$	4.5	—	0.17	0.26	—	0.33	
			$I_{OL} = 2.6mA$	6.0	—	0.18	0.26	—	0.33	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	1.0	—	10.0	μA

Output currents are 1/2 compared to TC74HC series models.

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, V_{CC} = 5V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C			UNIT
			MIN.	TYP.	MAX.	
Output Transition Time	t_{TLH} t_{THL}	—	—	4	8	ns
Propagation Delay Time	t_{pLH} t_{pHL}	—	—	11	21	ns

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input $t_r = t_f$ = 6ns)

CHARACTERISTIC	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}	—	2.0	—	50	125	—	145	ns
			4.5	—	14	25	—	30	
			6.0	—	12	21	—	24	
Propagation Delay Time	t_{pLH} t_{pHL}	—	2.0	—	48	100	—	235	
			4.5	—	12	20	—	48	
			6.0	—	9	17	—	40	
Input Capacitance	C_{IN}	—		—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	Note (1)		—	28	—	—	—	

Note (1) : C_{PD} is defined as the value of internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation :

$$I_{CC\,(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$